

MECH 200: Thermodynamics
Spring 2022 Syllabus (Subject to Change)

Instructor: Laura Schaefer, MEB 106, x3836, las14@rice.edu

Class Hours: TR, 1:00-2:15, Ryon 201 (3 credits)

Office Hours: TBD (usually 2 1-hr periods), and by appointment;

TAs: TBD, Office hours TBA

Objectives: By the end of the course, students will be able to:

- Analyze systems in terms of fundamental thermodynamic laws;
- Use tables to determine the properties of a pure substance for use in analysis;
- Perform mass and energy balances on systems and control volumes; and
- Understand the fundamentals of cycles and perform system-level calculations.

Outcomes: MECH 200 serves to help students achieve the following PLOs:

- An ability to apply knowledge of mathematics, science, and engineering;
- An ability to identify, formulate, and solve engineering problems; and
- An ability to use the techniques, skills, and modern tools necessary for practice.

Textbook: NOT REQUIRED: Fundamentals of Engineering Thermodynamics, Moran and Shapiro, 9th edition. (Earlier editions are okay, too, as are other authors. Just get access to *some* good, MECH-oriented thermo textbook.)

Requirement: Access to Excel and/or Matlab. I will also provide access to a great engineering thermodynamics software package (EES), but you have to be on campus to use it. Additionally, there are Excel/Matlab packages that approximate it.

Grading: Class Participation/Quizzes - 10 %
Homework (Late HW will not be accepted) - 20 %
Exam 1 - 25 % (*Tentative Exam Date: Feb. 22*)
Exam 2 - 25 % (*Tentative Exam Date: March 24*)
Analysis Project - 20 % (*Tentative Due Date: April 21*)

For all graded assignments, clarity in logic and in presentation is crucial. If you would like me to regrade an exam, return it to me with a written description of the errors within 1 week of receiving it. I reserve the right to regrade the entire exam.

Homework: Late homework will not be accepted. Homework will be given approximately weekly, is due at the beginning of class, even if you are remote (with a 10 minute “tardy” window). Not necessarily every HW problem will be graded.

Any handwritten homework SHOULD be turned in on engineering graph paper (if not egp, something with lines and divisions to help make it neat and clear), and the final answer must be “boxed in.” Electronically, homework must be a PDF file. Basically, the easier you make it for the TAs to read your work, the better!

You are allowed to work in groups on your homework – none of the HW assignments will be pledged, and there will be some duplication from problems assigned in previous semesters. I know that it is tempting to take the easy route with this, but, for your own sake in this class, I **strongly** urge you to refrain from consulting past semesters until after you have finished the assignment. You should turn in your own work, which you completely comprehend, or you will find yourself at a serious disadvantage on the exams.

- Project:** The last third of this class will be evaluated in the form of a group project, rather than an exam. Groups will consist of ~5 students, and students will evaluate each other at the end of the project, which may affect individual grades. Each group will be required to keep a collaborative, on-line log book in the form of a google doc to log your work on this project; this will also be shared with me. We'll see how the class shakes out with a mix of in-person versus remote students as to how the groups will be constituted.
- Attendance:** There is no explicit numerical penalty for missing class. However, class participation is a factor, and quizzes will occasionally be given. Moreover, in previous iterations of this course, I have observed a strong correlation between attendance and homework grades (and the resulting performance on exams).
- Honor Code:** Exams require the honor code statement and signature. Homework should be your own work, but studying and discussing the problems with others is permissible. Project work should be the group's effort. It is acceptable to discuss your project with others, but the work submitted must be that of **only your group**.
- ADA Notice:** If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.
- Office Hours:** Some of you are taking this class as freshman, and might not yet understand what office hours are. (This also might be true for some of the upper-level students – that is nothing to be ashamed about.) Office hours are not a terrifying time when I am going to yell at you about not understanding things in the class; rather, they are a time when you can gain more knowledge, ask questions you don't want to ask in front of the whole class, or just check up on things in general. Please don't be afraid to attend office hours!

Course Topics:

1. Introductory Concepts and Definitions - 2 classes - Ch. 1 (in Moran & Shapiro, varies by book)
2. Properties and Thermodynamic Relations - 3/4 classes - Ch. 3
3. First Law/Energy - 2/3 classes - Ch. 2 (and a bit of the end of Ch. 3)
4. Conservation of Mass and Energy for a Control Volume - 2 classes - Ch. 4
5. The Second Law and Entropy - 2/3 classes - Chs. 5 & 6
6. Exergy/Availability - 2 classes - Ch. 7
7. Vapor Cycles – 3/4 classes - Ch. 8
8. Gas Cycles - 3/4 classes - Ch. 9
9. Refrigeration and Heat Pump Cycles - 2 classes - Ch. 10
10. *Psychometrics - As Time Permits*

The above topics are subject to change based on the pace of the class and class dynamics.